Greetings and welcome to the **DECEMBER 2015** edition of the **WDFW Climate News Digest,** designed to provide highlights of relevant climate change news, events and resources for WDFW staff. Feedback or suggestions for items to include in future editions are much appreciated – many *thanks* to those who have sent links and references and please keep them coming. Note that previous editions of the newsletter are now stored on the Habitat Program Sharepoint site and on the agency's climate change web page, (scheduled for an update soon!)

Thanks for contributions this month from Wendy Connally, Bob Vadas, Marnie Boardman (DOH) and Jim Simmonds (King County). Other sources for articles include: Point Blue Conservation Science, NPLCC Climate Science Digest, Climate.gov, NOAA Climate Connection Newsletter. Contact Lynn for information on subscribing directly to any of these.

WHAT'S HAPPENING AT WDFW?

Agency Climate Team

WDFW is convening an informal group of agency representatives to revise the strategic goals for climate change originally adopted in 2009. The Team will work to ensure that the goals reflect our priorities for addressing the impacts of climate change and serve to guide efforts to protect the agency from unnecessary risk whenever possible. Team members will also explore the development of a draft policy aimed at ensuring that the agency considers the effects of climate change prior to making key investments or decisions. The Team plans to complete its work by February, 2016. For more information or to contribute to the group's work, please contact Lynn.

CLIMATE ADAPTATION AT OTHER ORGANIZATIONS

King County Climate Action Plan Approved!

The King County Council unanimously adopted an update to the King County Strategic Climate Action Plan. The news release is available here and the plan is available here.
Section 2 of the plan is about adapting to climate change, with a mix of actions, education, and research to complete over the next five years.

Department of Health hires Climate Change Coordinator

Marnie Boardman was recently hired to serve as Climate Change Coordinator at the Department of Health. Marnie serves as a point of contact for climate-change related work at the department and will be reaching out to other agencies and organizations to identify opportunities for collaboration. She joins other staff in the Office of Environmental Public Health Sciences and on the department's Cross-Agency Climate Change Workgroup who are applying public health approaches to assessing and addressing the impacts of climate change. She is eager to learn about your work! Contact: marnie.boardman@doh.wa.gov / 360-236-3344.

NOAA Guidance for the Use of Living Shorelines

This Guidance was developed in an agency wide effort to clarify NOAA's encouragement for the use of living shorelines as a shoreline stabilization technique along sheltered coasts. Living shorelines can preserve and improve habitats and their ecosystem services at the land-water interface. Although erosion is a natural coastal process, coastal communities face constant challenges from shoreline erosion that threaten valuable resources along the nation's coastline. Living shorelines are gaining attention around the country

as an alternative to traditional shoreline stabilization techniques like seawalls and bulkheads, which create a barrier between land and water.

Actions Underway to Combat Climate Change in National Parks

The National Park Service (NPS) released a report, "Coastal Adaptation Strategies: Case Studies" detailing actions underway to address climate change threats to infrastructure, recreation, and natural and cultural resources. The report follows a recent study that revealed sea-level rise caused by climate change could pose a risk to more than $40 billion worth of national park assets and resources.

New award recognizes outstanding efforts to increase awareness and safeguard U.S. natural resources from climate change

As part of President Obama's Climate Action Plan and the National Fish, Wildlife & Plants Climate Adaptation Strategy, an interagency group of federal, state, and tribal agencies announced creation of a new Climate Adaptation Leadership Award for Natural Resources.
Learn more here.

RESOURCES

The Puget Sound State of Knowledge Report *(from The Climate Impacts Group)*

State of Knowledge: Climate Change in Puget Sound is a comprehensive synthesis report summarizing relevant research on the likely effects of climate change on the lands, water, and people of the Puget Sound region. Part of the Climate Impacts Group's "State of Knowledge" series, this report details observed and projected changes for Puget Sound's climate, water resources, forests, species and ecosystems, coasts and ocean, infrastructure, agriculture, and human health in an easy-to-read summary format designed to complement the foundational literature from which it draws. The report also describes local climate change risk reduction activities and highlights data resources available to support local climate adaptation efforts. The work was funded by the U.S. Environmental Protection Agency via the Puget Sound Institute at UW Tacoma, the National Oceanic and Atmospheric Administration, and the State of Washington.
Download the report

Funding Opportunity for Ecological drought response (*from the NW Climate Science Center)*

The Northwest Climate Science Center is seeking Statements of Interest (SOIs) for innovative projects to help us assess which ecosystem components and ecological processes are most vulnerable to pronounced water deficiencies and to test or demonstrate new methods or technologies intended to lessen or adapt to the ecological impacts of drought. SOIs are due January 20, 2016.

Assessing Vulnerability and Developing Adaptation Strategies for Key Southern California Habitats *(from the California LCC news)*

Click here to access a recording of this webinar from November 19th. This webinar provided an overview of the project methods and key findings, discussed next steps, including an upcoming second adaptation workshop, and presented additional planned products to further support the decision-making needs of the region. Products from this effort are intended to provide information and tools for U.S. Forest Service planning and management as well as other natural resource management and conservation efforts to prepare for climate change impacts in Southern California.

November edition of the OWSC newsletter

The November edition of the OWSC newsletter is attached to this email and now available on our website. Topics include October climate summary, sea level and El Nino, new website content on windstorms, snowpack and drought update and temperature and precipitation outlook

Supporting Climate Adaptation Decisions for Estuarine Ecosystems of the San Francisco Bay
This project brought together natural resource managers, conservation coordinators and planners, and scientists working within the San Francisco Bay to identify optimal management alternatives that can be coordinated among partners to achieve fundamental objectives for conservation in San Francisco Bay in the face of climate change.
The final report "Developing a spatially-explicit climate adaptation framework for estuarine ecosystems of the San Francisco Bay" is now available on the Climate Commons.

Climate Data - *from Climate.gov*
Explore this tool to access simple graphs of Climate Normal data for temperature and precipitation for 1981-2010 from weather stations across the country.

Washington's Clean Air Rule Development
The Department of Ecology recently hosted a Clean Air Rule webinar. We have posted the recording of the webinar and the slides used in the presentation on our public engagement webpage:

- November 18 Clean Air Rule Presentation
- November 18 Clean Air Rule Webinar Recording

LEARNING OPPORTUNITIES

December 2nd, 12:30 (Pacific time) - *Massachusetts Wildlife Climate Action Tool*
The Massachusetts Wildlife Climate Action Tool is designed to inform and inspire local action to protect the Commonwealth's natural resources in a changing climate. This tool focuses on providing information for a range of local decision-makers, including conservation practitioners, landowners, municipal agencies, and community leaders, seeking to conduct on-the-ground climate change adaptation efforts.

December 3, 3:30-4:30 (Pacific time) – OSU Seminar, *"Evaluating the effects of ocean acidification on organisms to communities",* featuring Thomas Hurst, NOAA-Alaska Fisheries Science Center. For the live broadcast of the seminar via Adobe Connect see: http://oregonstate.adobeconnect.com/hmsc-fw407/

December 3, 11:00-12:00 (Pacific time) – "*Enhancing the resilience of riparian/wetland ecosystems in light of climate change",*
featuring Andrew Breibart, BLM and Betsy Neely, TNC. To register now, please visit the following link: https://nctc.adobeconnect.com/e8udk6y6c5a/event/registration.html

December 8, 12:00 (Pacific time) - "***How to Prioritize Key Areas for Conservation Efforts in a Changing Climate: A Look at "Climate Refugia"***
Climate refugia" are often highlighted as potential target areas for conservation because they are buffered from climate change and therefore can help to ensure greater protection of wildlife and resources. In this presentation, Toni Lyn Morelli will summarize the physical processes that create climate refugia, discuss a new framework for locating and managing them, and use examples to illustrate ways to identify and verify climate refugia. Register here.

December 10th, 11:00 -12:00 (Pacific time) – *Sea level Rise Adaptation Tools*
In 2013, the NPLCC partnered with Friends of the San Juans, Coastal Geological Services Inc., U.S. Geological Survey, and Resource Media to develop sea-level rise adaptation tools for San Juan archipelago and Salish Sea to determine how rising sea levels might affect the islands. Though this study was specific to the San Juan Islands, process, results, and lessons learned can be used as a case study applicable to other coastal geographies. Register here:

December 10th, 10:00 am (Pacific time) – *"The Rapidly Changing Arctic"*
Featuring Fran Ulmer, Chair of the U.S. Arctic Research Commission. You can register for the webinar here.

January 2016 – June 2016 – Climate Smart Conservation Academy (registration closes Friday, December 11th)
This 6 month online course is designed to cover the fundamentals of climate science, provide tools and resources for climate adaptation, and increase climate literacy and communication. Course participants will then develop a final product (such as a report or presentation) addressing climate change in their management of natural resources.
Registration fee is $200. For more information about how to register, please contact Lynn, or Ashley_Fortune_Isham@fws.gov.

CLIMATE SCIENCE NEWS

October 2015 was fourth warmest October for contiguous U.S *(from NOAA)*
The first ten months of 2015 were the sixth warmest on record for the Lower 48. This monthly summary from NOAA's National Centers for Environmental Information is part of the suite of climate services NOAA provides to government, business, academia and the public to support informed decision-making

Two posts from Climate.gov
Climate change rule of thumb: cold "things" warming faster than warm things *(from Climate.gov)*
This post looks at one of the more well-grounded "rules of thumb" for understanding climate change: cooler "things" are warming more quickly than warmer things. This rule of thumb is really dominated by the fact that the arctic is the fastest-warming large region on the planet. The Arctic is warming at more than twice the rate of the rest of the world. This "Arctic amplification" is driven by a handful of factors; the largest of these is the retreat of seasonal snow and ice. More here.

Exactly the same, but completely different: why we have so many different ways of looking at sea surface temperature *(from Climate.gov)*
This post explores why scientists use so many different datasets used to determine sea surface temperatures, a key predictor of El Nino strength.

Northern lakes act as carbon dioxide chimneys in a warming world (*from Science Daily)*
Many of the world's approximately 117 million lakes act as wet chimneys releasing large amounts of the greenhouse gas carbon dioxide into the atmosphere. The most recent estimates show that carbon dioxide emissions from the world's lakes, water courses and reservoirs are equivalent to almost a quarter of all the carbon dioxide produced by burning fossil fuels.

Abrupt tipping points *(from PNAS)*
One of the most concerning consequences of human-induced increases in atmospheric greenhouse gas concentrations is the potential for rapid regional transitions in the climate system. Yet, despite much public

awareness of how “tipping points” may be crossed, little information is available as to exactly what may be expected in the coming centuries. In this study, a group of scientists assessed all Earth System Models underpinning the recent 5th Intergovernmental Panel on Climate Change report and systematically searched for evidence of abrupt changes

Sixty Years of Data Show Waves are Getting Stronger, Threatening Coastlines and Infrastructure *(from The Nature Conservancy)*
Recently, we have been able to show that wave energy has been changing throughout the last six decades. After comparing the differences in wave energy throughout the decades, we found that there was more energy in waves in many regions from the 90s and 00s as compared to the 80s (see map). Indeed, the wave energy has been increasing greatly across nearly the entire Southern Ocean covering most of the coasts of South America, Africa, Australia and Micronesia. The pattern is more complex in the northern hemisphere with Europe and the US West coast seeing less wave energy, but the US-East and Caribbean seeming somewhat more wave energy.

SPECIES AND HABITATS

Warming waters a major factor in Gulf of Maine cod collapse *(from NOAA)*
For centuries, cod was the backbone of New England's fisheries and a key species in the Gulf of Maine ecosystem. Today, cod stocks in the gulf are on the verge of collapse, hovering at 3-4 percent of sustainable levels. Even setting tighter limits on fishing has failed to slow this rapid decline. Now a new report in *Science* sheds light on how rapid warming has reduced cod's rebound capacity and complicated fisheries management.
More here.

Breeding flexibility helps migratory songbirds adjust to climate warming *(from Science Daily)*
Phenological mismatches, or a mistiming between creatures and the prey and plants they eat, is one of the biggest known impacts of climate change on ecological systems. But a new study finds that one common migratory songbird has a natural flexibility in its breeding time that has helped stave off mismatches, at least for now. The results suggest this flexibility provides a buffer against climate warming for the black-throated blue warbler in eastern North America and potentially for other migratory forest birds in temperate zones, but such resilience probably has limits. The study appears in the journal *Oikos*. Nina K. Lany, M. P. Ayres, Erik E. Stange, T. Scotty Sillett, Nicholas L. Rodenhouse, Richard T. Holmes. Breeding timed to maximize reproductive success for a migratory songbird: the importance of phenological asynchrony. *Oikos*, 2015; DOI: 10.1111/oik.02412

Elevating Drowning Salt Marshes (*from Rhode Island Sea Grant)*
While many coastal residents are seeking measures to protect their homes from a rising sea and increased flooding, one is quietly losing its bid on coastal real estate and could disappear forever. Read the story »

Performance of Natural Infrastructure and Nature-based Measures as Coastal Risk Reduction Features
This Environmental Defense Fund report represents the review of the state of knowledge on the performance of natural and nature-based infrastructure as compiled from existing literature and participant input obtained during an expert workshop in May 2015. Read more.

Study offers model to predict how microbiomes may respond to change (*from Science Daily)*
Scientists studying microbiomes have created a framework for predicting how the composition of these complex microbial communities may respond to changing conditions.

POLICY AND MANAGEMENT - MITIGATION AND ADAPTATION

The Paris Climate Talks – COP 21: What's it all about? *(from COP21Paris.org)*

The international political response to climate change began at the Rio Earth Summit in 1992, where the 'Rio Convention' included the adoption of the UN Framework on Climate Change (UNFCCC). This convention set out a framework for action aimed at stabilizing atmospheric concentrations of greenhouse gases (GHGs) to avoid "dangerous anthropogenic interference with the climate system." The UNFCCC which entered into force on 21 March 1994, now has a near-universal membership of 195 parties.

The main objective of the annual Conference of Parties (COP) is to review the Convention's implementation. The first COP took place in Berlin in 1995 and significant meetings since then have included COP3 where the Kyoto Protocol was adopted, COP11 where the Montreal Action Plan was produced, COP15 in Copenhagen where an agreement to success Kyoto Protocol was unfortunately not realized and COP17 in Durban where the Green Climate Fund was created.

In 2015, COP21, also known as the 2015 Paris Climate Conference, will, for the first time in over 20 years of UN negotiations, aim to achieve a legally binding and universal agreement on climate, with the aim of keeping global warming below 2°C

- Governor Jay Inslee and Chris Davis, his senior advisor on climate, will both be participating in the event. The Georgetown Climate Center is organizing side meetings on state and local actions to reduce GHG – Chris Davis will be speaking at two of these.
- Yale Environment 360 is providing daily coverage of the climate talks here.

Science alone cannot save the planet, insists spiritual leader of Orthodox Church *(from The Telegraph, United Kingdom)*

Science alone cannot save the planet the spiritual leader of an estimated 300 million Orthodox Christians has insisted, as he joined forces with the Archbishop of Canterbury urging followers around the world to fight climate change. The Church of England has been urging worshippers to dedicate one day every month to fasting and prayer for the planet as part of a major drive to instill green ideas in its followers. It is also sending a delegation on a 250-mile walking "pilgrimage" to Paris in the run-up to the conference. Patriarch Bartholomew was the first world faith leader to raise climate change as a key religious issue and was a major influence on Pope Francis's recent encyclical on the environment. Speaking in Lambeth Palace on Tuesday, he said that for Christians protecting the planet was a "sacred task and a common vocation". "Global warming is a moral crisis and a moral challenge," he said.